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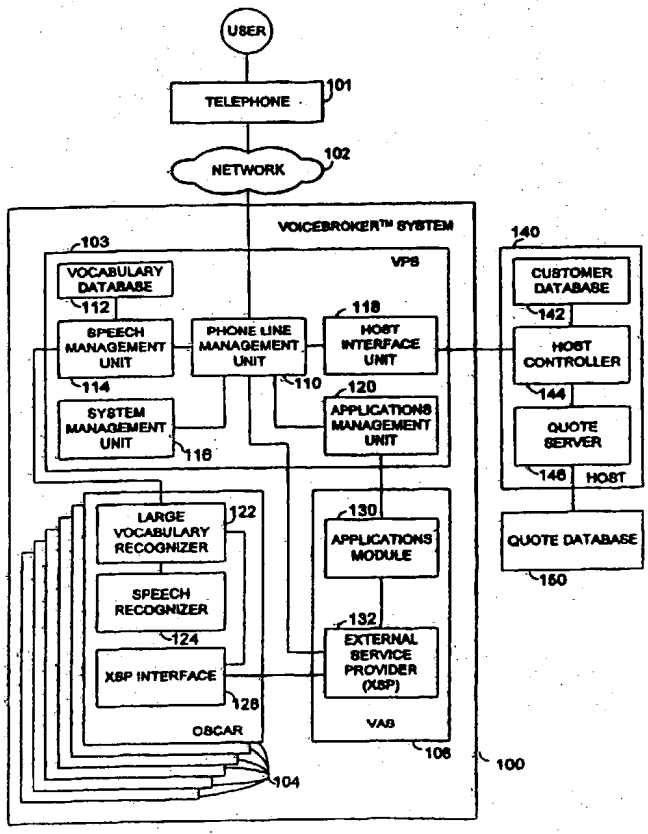
(54) Title: SYSTEM AND METHOD FOR AUTOMATICALLY PROVIDING FINANCIAL SERVICES TO A USER USING SPEECH SIGNALS

(57) Abstract

A computer based system and method utilizing speech recognition technology for automatically providing financial information to a client without requiring a service representative and enabling a client to easily and efficiently provide information to the financial service provider. The system includes a speech processor (103) that receives a speech signal spoken by a user into a telephone (101) and identifies the term spoken by the user by comparing the received signal with a stored predefined vocabulary (112). The speech applications (130) interpret the recognized term and perform a requested financial service transaction and provide information to the user regarding this transaction via the telephone system (101), for example. In addition, the present system and method utilizes speech recognition technology to provide a security system (140) that prevents unauthorized access to a financial account.



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# SYSTEM AND METHOD FOR AUTOMATICALLY PROVIDING FINANCIAL SERVICES TO A USER USING SPEECH SIGNALS

Inventor: Alan Bradley Nathan

## BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the field financial services and more particularly to the field of automatic speech recognition for financial services.

2. Description of Background Art

Financial service providers have traditionally provided a variety of techniques for obtaining financial information and for trading financial instruments. One common technique involves having a representative of the financial institution meet directly with a customer. The representative can counsel the client in financial matters, can provide financial information to the user, e.g., stock quotes, and can execute financial transactions for the user. However, it is generally neither efficient nor necessary to have a representative directly involved in providing all financial services to a client. The cost of providing some services to a user, e.g., providing information regarding recent transactions or providing stock quotes, is time consuming and expensive when performed by a financial service representative. The cost of employing enough representatives to properly service clients is expensive. In addition, representatives are more likely to make errors than an automated process when performing certain services. For example, when providing financial information to a client or when conducting a financial transaction for a client.

In order to reduce the cost of providing financial services some financial service providers enable users to access financial information via a telephone. The user calls a financial service provider and listens to a message that describes various options, the user selects the appropriate

option by depressing a data tone multiple frequency (DTMF) button on a conventional telephone touch pad. The user is then walked through various menus until the user is able to provide enough information such that the financial service provider can provide the service requested by the client. While this technique is more efficient than the having a representative meet directly with a customer, it still has several significant disadvantages. One disadvantage is that the user must provide information to the financial service provider using only a telephone touch pad. This technique is tedious and inefficient when the user attempts to input information that is not in the form of a numbered list. For example, if a user wants to obtain a quote on a stock, it is difficult for a user to input the name of stock using only a telephone touch pad since most numbers on a telephone touch pad correspond to three letters. The problem of receiving inputs from a user increases as the amount of information the client must provide to the financial service provider increases. Accordingly, the touch pad technique is not efficient for many type of complex financial transactions, e.g., option trading, where the user must input a significant amount of information.

Accordingly, what is needed is a system and method that: (1) automatically provides financial information to a client without requiring a service representative; (2) increases the efficiency of a financial service transaction when compared to conventional systems; (3) increases the accuracy of a financial service transaction when compared to conventional systems; (4) enables a client to easily and efficiently provide information to the financial service provider; (5) enables a financial service provider to easily and efficiently perform various financial services for a client automatically, including complex financial transactions.

## SUMMARY OF THE INVENTION

The present invention is a system and method for automatically providing financial information to a client without requiring a service representative, increasing the efficiency and accuracy of a financial service transaction when compared to conventional systems, enabling a client to easily and efficiently provide information to the financial service provider, and enabling a financial service provider to easily and efficiently perform various financial services for a client automatically, including complex financial transactions.

The system includes a speech processor that receives a speech signal spoken by a user into a telephone and identifies the term spoken by the user by comparing the received signal with a predefined vocabulary. The speech applications interpret the recognized term and, after receiving the necessary information, the speech applications perform a requested financial service transaction and provide information to the user regarding this transaction via the telephone system, for example. Some of the financial service transactions supported by the present invention include, providing stock quotes, providing mutual fund quotes, providing option quotes, providing account information, trading stocks, trading mutual funds, and trading options. In addition, the present invention utilizes the speech recognition technology to provide a security system that prevents unauthorized access to a financial account.

## BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an illustration of the computer system in which the preferred embodiment of the present invention operates.

Figure 2 is a more detailed illustration of an applications module according to a preferred embodiment of the present invention.

Figure 3 is a flow chart illustrating a process performed by a controller according to a preferred embodiment of the present invention.

Figure 4 is a flow chart illustrating a process performed by an account module according to a preferred embodiment of the present invention.

Figure 5 is a flow chart illustrating a process performed by an alternatives/error handler according to a preferred embodiment of the present invention.

Figure 6 is a flow chart illustrating a process performed by a security module according to a preferred embodiment of the present invention.

Figure 7 is a flow chart illustrating a process performed by a selection module according to a preferred embodiment of the present invention.

Figure 8 is a flow chart illustrating a process performed by a quotes module according to a preferred embodiment of the present invention.

Figure 9 is a flow chart illustrating a process performed by a stocklist module according to a preferred embodiment of the present invention.

Figure 10 is a flow chart illustrating a process performed by an option quote module according to a preferred embodiment of the present invention.

Figures 11A-D are flow charts illustrating a process performed by a trade module according to a preferred embodiment of the present invention.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

A preferred embodiment of the present invention is now described with reference to the figures where like reference numbers indicate identical or functionally similar elements. Also in the figures, the left most digit(s) of each reference

phrase is called a spoken term. The spoken term is transmitted to the application in the applications module 130 that requested information from the user. The phrase "spoken term" refers to the recognized term or phrase based upon an audio signal received from a user.

The application can then utilize the information in the term and can request additional information. The applications can request additional information from, or can provide information to, the user by generating a signal that requests that certain recordings in the vocabulary database 112 be transmitted to the user. The application in the applications module 130 transmits the request signal to the applications management unit 120 that transmits the request to the speech management unit 114 via the phone line management unit 110. The speech management unit 114 selects the appropriate recordings, e.g., a query or a stock quote, generates a response signal, and transmits the response signal to the phone line management unit 110 that transmits the response signal to the user via the network 102. It is envisioned that the flow of signals may vary from what is described above and that some functions may be added or deleted without departing from the present invention. The process described above represents what occurs when an application queries a user.

Figure 2 is a more detailed illustration of the applications module 130 according to a preferred embodiment of the present invention. In the preferred embodiment, the applications module 130 includes a controller 202, an account module 204, an alternatives/error hander (A/EH) 206, a security module 208, a selection module 210, a quotes module 212, a stocklist module 214, an option quote module 216, and a trade module 218. The operation of each of the applications in the applications module 130 is described in detail below with reference to Figures 3-11. The controller 202 controls

communications between the applications module 130 and the XSP 132 and the applications management unit 120. In addition, the controller 202 controls the operation of the applications in the applications module 130. The operation of the controller 202 is now described in greater detail with reference to Figure 3.

Figure 3 is a flow chart illustrating a process performed by the controller 202 according to a preferred embodiment of the present invention. The controller 202 first calls 302 the account module 204. The operation of the account module 204 is described below with reference to Figure 4. After successfully completing the account module 204, the controller 202 calls 304 the security module 208. The operation of the security module 208 is described below with reference to Figure 6. After successfully completing the security module 208 the controller 202 calls 306 the selection module 210. The operation of the selection module 210 is described below with reference to Figures 7-11. After completing the selection module 210 the controller 202 queries the user for another selection and calls 306 the selection module 210 if another selection is received. If another selection is not received the controller 202 asks if the user wants to access another account. If the user wants 312 to access another account the controller 202 repeats its process and calls 302 the account module 204. If the user does not want to access another account the controller 202 terminates the call. As described above, when a call is initiated, the controller 202 calls 302 the account module 204. The operation of the account module 204 is now described.

Figure 4 is a flow chart illustrating a process performed by the account module 204 according to a preferred embodiment of the present invention. The account module 204 queries 402 the user for the user's account number using the procedure described above, for example. The user speaks into the telephone 101 and the VoiceBroker™ system 100 identifies the term spoken by the

user. The account module 204 then determines 404 if the spoken term corresponds to a valid account number by accessing the customer database 142. If the spoken term is a valid account number the process continues 408 and process control returns to the controller 202. If the spoken term is not a valid account number the account module 204 calls 406 the alternatives/error handler (A/EH) 206.

Figure 5 is a flow chart illustrating a process performed by the alternatives/error handler 206 according to a preferred embodiment of the present invention. The alternatives/error handler 206 manages the procedure for handling spoken terms that do not answer the most recent query. For example, in the preferred embodiment the user has the option of requesting help in answering a query. In response to a "help" request the alternatives/error handler 206 will generate a message that will provide more information to the user that is related to the question asked. This is one type of alternate option that is available to the user. In some contexts other alternate options are also available to the users. For example, after the user has satisfied the security module 208 the user can return to a main menu, e.g., the selection module 210, by speaking the words "main menu" at any time. The user can similarly transfer to a specific module to perform a specific function within the VoiceBroker™ system 100 by speaking a predetermined term, e.g., "trade." The user may also modify the user's security code at any time after successfully completing the security module 208. Another option enables the user to transfer to a customer service representative by saying the phrase "customer service" or a similar term/phrase, e.g., "representative", "agent", "service", "transfer", or "broker". If the alternatives/error handler 206 determines 502 that the spoken term is a valid alternate option then the alternatives/error handler 206 calls the appropriate function to implement 504 the function. If the

spoken term is not a valid alternate option the alternatives/error handler 206 informs 506 the user that the spoken term is an invalid response and determines 508 if the user should be transferred to a customer service representative. The user is automatically transferred to a customer service representative if the user does not answer a question correctly after a number of attempts. The number of attempts can vary depending upon the context of the system, e.g., if the process of the security module 208 is being implemented then the number of incorrect responses that will cause the alternatives/error handler 206 to transfer the user to customer service may be less than other, less critical, contexts. If the alternatives/error handler 206 determines 508 that the user should be transferred to a customer service representative, the alternatives/error handler 206 transfers 510 the user. If the alternatives/error handler 206 determines 508 that such a transfer is not necessary than the process continues and control passes to the module that called the alternatives/error handler 206. For example, if the account module 204 calls 406 the alternatives/error handler 206, when the alternatives/error handler 206 continues 512, the account module 204 will again query 402 the user for the account number and the process continues until either a correct account number is spoken or the alternatives/error handler 206 transfers 510 the user to a customer service representative. As described above, if the spoken term identifies a valid account number the account module 204 continues 408 and the controller 202 calls 304 the security module 208. The operation of the security module 208 is now described.

Figure 6 is a flow chart illustrating a process performed by the security module 208 according to a preferred embodiment of the present invention. The security module 208 queries 602 the user for an account security code. The account security code can be a combination of numbers or words, for example. The

first time a user accesses the VoiceBroker™ system 100 a security code may not exist. In such a situation the security code can be a predefined code, e.g., the last several digits of the users social security number or home phone number. The user will then be requested to select a new security code as described below. After the security module 208 asks the user for an account security code the user replies by speaking the security code. The VoiceBroker™ system 100 identifies the term spoken, as described above. The security module 208 compares the spoken term with the security code stored in the customer database 142. If the spoken term is not the valid security code, the security module 208 calls 606 the alternatives/error handler 206. As described above, the alternatives/error handler 206 determines 502 if a spoken term corresponds to an alternate option in which case the alternate option is implemented 504. Otherwise, the user is informed 506 that the spoken term does not correspond to the proper security code and the user is either transferred 510 to a customer service representative or the process continues 512 and the security module 208 repeats the query 602 for the account security code.

If the spoken term matches the account security code the user has the option 608 to select a new account security code. If the user selects to enter a new security code, or if this is the first access to the VoiceBroker™ system 100, the security module 208 asks 610 the user for the new account security code. The security module 208 then determines 612 whether the spoken term is a valid security code, e.g., in the preferred embodiment the last four digits of the user's social security number is not a valid security code. Alternately if words can be a security code the term "help" may not be a valid security code since it has an independent meaning in the VoiceBroker™ system 100. If the spoken term is not a valid account security code 612, the security module 208 calls 614 the alternatives/error handler

206. The alternatives/error handler 206 proceeds as described above. If the spoken term is a valid account security code the security module 208 asks 616 the user to verify 616 the new account security code by repeating the term, for example. The security module 208 determines if the account security code is verified 608. If verified, the process continues 620. If the account security code is not verified steps 610-618 are repeated. If the user does not want to select a new account security code 608 the process continues and the controller 202 calls 306 the selection module 210.

Figure 7 is a flow chart illustrating a process performed by the selection module 210 according to a preferred embodiment of the present invention. The selection module 210 queries 702 the user to select an activity. If the spoken term indicates that the user wants to obtain a quote 704, the selection module 210 calls 706 the quotes module 212. If the spoken term indicates that the user wants to create or modify a stocklist 708, the selection module 210 calls 710 the stocklist module 214. If the spoken term indicates that the user wants to obtain an option quote 712, the selection module 210 calls 714 the option quote module 216. If the spoken term indicates that the user wants to trade a financial instrument 716, the selection module 210 calls 718 the trade module 218. If the spoken term does not correspond to any of these options, the selection module 210 calls 720 the alternatives/error handler 206. As described above, if the spoken term indicates that the user wants to obtain a quote 704 the selection module 210 calls 706 the quotes module 212. The process performed by the quotes module 212 is now described.

Figure 8 is a flow chart illustrating a process performed by a quotes module 212 according to a preferred embodiment of the present invention. If the user wants to obtain a quote the quotes module 212 queries 802 the user on the type of quote. In

the preferred embodiment two types of quotes are available, short quotes and full quotes. The difference is the amount of information sent to the user. For example, a short quote can include the name of the financial instrument, quote flags - a set price or volume alert for a financial instrument or stocklist-, the price, and the recent variance in the price. A long quote can include all of the short quote information along with the bid price, the asking price, the high and low value over a set period, and the trading volume, for example.

The quotes module 212 determines 804 if the spoken term is a valid quote type. If not, the quotes module 212 calls 806 the alternatives/error handler 206. If the spoken term is a valid quote type, the quotes module 212 stores such information in volatile memory and queries 808 the user on the quote request. The quote request is a name of a financial instrument. In the preferred embodiment, option quotes are handled separately (see discussion below). However, in an alternate embodiment option quotes can be handled in the quotes module 212 by modifying the information requested from and transmitted to the user. The preferred embodiment recognizes a variety of names for each financial instrument. For example, the user can refer to a stock by its full company name, by a shortened company name, a slang of the company name, or by the ticker reference. As described above, these alternatives are stored in the speech recognizer 124. The quotes module 212 determines 810 if the spoken term is a valid quote request. If not, the quotes module 212 calls 812 the alternatives/error handler 206. If the spoken term is a valid quote request the quotes module 212 obtains 814 quote information on the requested financial instrument. As described above, the quote database includes recent quote information. The quotes module 212 generates a quote request signal that is transmitted through the VPS 103 to the host system 140. The quote server 146 in the host system 140

accesses the quote database to obtain the quote information and transmits a signal representing this information to the quotes module 212 via the VPS 103. The quotes module 212 then transmits the quote information to the user in the manner described above. In the preferred embodiment, process control remains with the quotes module 212 and the user is asked 808 for another quote request. As described above, the user can exit the quotes module 212 by requesting an alternate option, e.g., "trade" or "main menu."

As described above, if, when the selection module 210 has process control, the spoken term indicates that the user requested to create or modify a stocklist, the selection module 210 calls 710 the stocklist module 214. The process performed by the stocklist module 214 is now described. Figure 9 is a flow chart illustrating a process performed by a stocklist module 214 according to a preferred embodiment of the present invention. In the preferred embodiment the user is permitted to define one or more lists of financial instruments. This list is called a stocklist. The user can then obtain a quote for each of the financial instruments in the list. For example, with respect to Figure 8, a valid quote request can be the name of a stocklist. The quotes module 212 then obtains 814 quote information on all of the financial instruments in the stocklist and informs 816 the user of the quotes. If the user requests to create or modify a stocklist, the stocklist module 214 queries 902 the user for the name of a stocklist. As indicated above, each account can have many stocklists. The stocklist module 214 determines 904 if the spoken term is an existing stocklist. If not, the stocklist module 214 determines if the user wants to create 906 a new stocklist by determining if the spoken term is a valid stocklist name and by possibly querying the user. If the stocklist module 214 determines 906 that the user does not

want to create a new stocklist the stocklist module 214 calls 908 the alternatives/error handler 206.

If the spoken term is either an existing stocklist or the user wants to create a new stocklist, the stocklist module 214 asks 910 the user for the name of an entry. The stocklist module 214 determines 912 if the spoken term is a valid entry. A valid entry is the name of a financial instrument, e.g., a stock name, a mutual fund name, a market indicator (e.g., the Dow Jones Industrial Average), or an option name. If the spoken term is not a valid entry the stocklist module 214 calls 914 the alternatives/error handler 206. If the spoken term is a valid entry the stocklist module 214 determines 916 if the valid entry is to be added or deleted to the stocklist by comparing the valid entry with the existing entries in the stocklist. If the valid entry coincides with an existing entry the stocklist module 214 determines 916 that the entry should be deleted, otherwise the valid entry should be added to the stocklist. The stocklist module 214 queries 922 the user to confirm the request. If the received spoken term confirms 924 the request the stocklist module 214 executes 926 the request. If the spoken term does not confirm the request the stocklist is not modified. The user then decides 928 whether to continue modifying the same stocklist or to modify a different stocklist. If the user decides to modify the same stocklist the stocklist module 214 process returns to step 910. Otherwise the process returns to step 902 and the user is queried for a stocklist name. As described above, the user can exit the stocklist module 214 by speaking the name of an alternate option.

As described above, if, when the selection module 210 has process control, the spoken term indicates that the user wants to obtain an option quote, the selection module 210 calls 714 the option quote module 216. The process performed by the option quote module 216 is now described. Figure 10 is a flow

chart illustrating a process performed by an option quote module 216 according to a preferred embodiment of the present invention. The option quote module 216 queries 1002 the user on the type of option quote, e.g., short or full option quotes. Short and full option quotes differ in the amount of information transmitted to the user, as described above. If the spoken term is not a valid option type 1004 the option quote module 216 calls 1006 the alternatives/error handler 206. If the spoken term is a valid option type 1004 the option quote module 216 queries 1008 the user on the underlying issue and parameters of the options. In the preferred embodiment the underlying issue that the user provides is the name of the underlying entity and can be a stock name or an index name. In alternate embodiments additional options can be traded, e.g., index options. The parameters that the user provides include: (1) the expiration month - which is the calendar month in which an option expires if exercise instructions have not been received; (2) the strike (exercise) price - which is the predetermined price at which the underlying entity can be bought or sold upon exercise; (3) the type of option - which is the classification of an option as either a put option or a call option; and (4) the expiration year - which is the year in which the option expires and is necessary for some long terms options and warrents. In the preferred embodiment the user can provide the underlying issue and parameters in a single sentence, i.e., without having the option quote module 216 prompt the user for the underlying issue and each parameter. Alternatively, the user can be requested to provide the underlying issue and each parameter individually or the user can provide some information and the option quote module 216 will determine what information is missing and can request only that information.

Alternatively, a stocklist for options can be used. The process for quoting the stocklist is similar to the process in

Figure 10 except that the spoken term identifies 1008 a stocklist. The stocklist is a list of option names and underlying issues and parameters. The process for creating and modifying a stocklist for options is similar to the process described above with reference to stocklist module 214 with an option stocklist storing additional information, e.g., the underlying issues and parameters.

After the user speaks the name of the underlying issue and parameters, the options module 216 determines 1010 whether the spoken term is a valid response. If not, the option quote module 216 calls 1012 the alternatives/error handler 206. If the spoken term is a valid response the option quote module 216 obtains 1014 the underlying option quote information from the quote database 150 using a technique that is similar to the quote retrieving technique described above. The option quote module 216 then provides 1016 the quote information to the user via the VPS 103. In the preferred embodiment the option quote module 216 asks 1008 the user for another underlying issue and parameters. If the user wants to trade the option the user can speak the word "trade." However, in an alternate embodiment the default is that the user will be asked if the user wants to trade the option and the process continues at step 1112 in Figure 11, described below.

As described above, if, when the selection module 210 has process control, the spoken term indicates that the user wants to perform a trade, the selection module 210 calls 714 the trade module 218. The process performed by the trade module 218 is now described. Figures 11A-D are flow charts illustrating a process performed by a trade module 218 according to a preferred embodiment of the present invention. If the user requests to perform a trade the trade module 218 queries 1102 the user on the name of the financial instrument to trade, e.g., stock, mutual fund, option, future, commodity, unit investment trust

(UIT), real estate investment trust (REIT), foreign currency, real property, or precious metal, for example. The trade module 218 determines 1104 if the spoken term represents a valid financial instrument. If not, the trade module 218 calls 1106 the alternatives/error handler 206. If the spoken term does represent a valid financial instrument the trade module 218 obtains 1108 quote information for the financial instrument. Some techniques for obtaining quote information are described above. The trade module 218 then informs 1110 the user of the quote information and asks 1112 the user for the trade type, e.g., buy or sell. If the received spoken term indicates 1114 that the user wants a quote on another financial instrument the trade module 218 returns to step 1102. If not, the trade module 218 determines whether the spoken term indicates that the user wants to either buy 1116 or sell 1118. If the spoken term does not correspond to either buying or selling the trade module 218 calls 1120 the alternatives/error handler.

If in response to the query 1112 for the trade type the spoken term, i.e., the interpretation of the user's response, is to buy, the trade module 218 determines 1144 (Figure 11C) whether the trade is permitted without the help of a customer service representative. If a customer service representative is necessary, the trade module 218 transfers 1146 the user. Some trades may require a customer service representative, for example swapping certain mutual funds, buying an initial public offering (IPO) of an equity which requires document receipt beforehand, buying a non-listed security, or buying foreign securities. If a customer service representative is not necessary the trade module 218 determines 1148 whether the proposed transaction is suitable for the user. A buy transaction can be compared with suitability factors to determine whether the transaction is consistent with the financial goals of the user. Suitability factors can include

(1) investment objectives, e.g., capital preservation, income, growth, or speculation; (2) annual income; (3) liquid net worth; and (4) tax bracket. A transaction is suitable if the financial instrument to be bought is consistent with the financial goals of the user given the above factors, for example.

If the trade module 218 determines 1148 that the transaction is not suitable for the user the trade module 218 will attempt to update 1150 the suitability factors of the user. Information concerning the suitability of the transaction is sent to the user and the user is then prompted to update the suitability factors. The user has the option of not providing information relating to any or all of the suitability factors. When the user does not provide complete information the trade module 218 informs the user that the VoiceBroker™ system 100 cannot determine the suitability of the transaction. However, the user will be permitted to continue the trade.

If the transaction is suitable 1148 or if the user wants to disregard the warnings of a non-suitable transaction or if the trade module 218 cannot determine if the transaction is suitable, the trade module 218 queries 1152 the user on the investment amount. If the spoken term is not a valid amount, e.g., if the amount exceeds a predetermined limit for the user, the trade module 218 calls 1156 the alternatives/error handler 206. Otherwise the trade module 218 provides 1158 the user with the trade information and asks the user to confirm the transaction. If the user does not confirm the transaction 1160 the trade module 218 calls 1162 the alternatives/error handler 206. If the spoken term indicates that the user confirms the transaction the trade module 218 determines 1164 if the buying requirements for the financial instrument is satisfied - some financial instruments require a minimum purchase amount. If the buying requirements are not met the trade module 218 informs

1166 the user of such requirements and asks 1152 the user to enter a new investment amount.

If the buying requirements are satisfied the trade module 218 informs the user of the transaction fee and queries 1168 (Figure 11D) the user for fee instructions. Examples of fee instructions include adding the fee to the transaction amount and subtracting the fee from the transaction amount. If the spoken term does not represent a valid fee instruction 1170 the trade module 218 calls 1172 the alternatives/error handler 206. If the spoken term does represent a valid fee instruction 1170 then the trade module 218 queries 1174 the user for fund standing instructions. Examples of fund standing instructions include having capital gains, dividends, or distributions, from the financial instrument reinvested or paid as cash. If the spoken term does not represent a valid response 1176 from the user the trade module 218 calls 1178 the alternatives/error handler 206. If the spoken term does represent a valid response 1176 the trade module 218 provides 1136 (Figure 11B) the user with the confirmation information and requests that the user confirm the transaction. If the spoken term indicates 1138 that the user confirmed the transaction the trade module 218 executes 1140 the order and the transaction is complete. If the spoken term indicates that the user did not confirm the transaction the trade module 218 cancels the order. The trade module 218 then repeats its process and queries 1102 the user for the name of a financial instrument to trade.

If in response to the query 1112 for the trade type the spoken term corresponds to a sell request, the trade module 218 determines 1122 if the user owns the financial instrument identified in step 1104. If the user does not own the financial instrument the trade module 218 informs 1124 the user of this fact and queries 1102 the user for another financial instrument. If the financial instrument is valid 1122, the trade module 218

queries 1130 (Figure 11B) the user for the quantity to sell. If the spoken response is not a valid quantity, e.g., if the quantity is more than the user owns, or if the user spoke another term (e.g., "help"), then the trade module 218 calls 1134 the alternatives/error handler 206. If the quantity is valid 1132 the trade module 218 provides 1136 the user with the confirmation information and requests that the user confirm the transaction. If the spoken term indicates 1138 that the user confirmed the transaction the trade module 218 executes 1140 the order and the transaction is complete. If the spoken term indicates that the user did not confirm the transaction the trade module 218 cancels the order. The trade module 218 then repeats its process and queries 1102 the user for the name of a financial instrument to trade.

While the invention has been particularly shown and described with reference to a preferred embodiment, it will be understood by persons skilled in the relevant art that various changes in form and details can be made therein without departing from the spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A computer based system for providing financial information to a user comprising:

a receiving unit, for receiving electromagnetic speech signals representing audio signals from the user;

a library of terms, having a plurality of terms defined therein;

a customer database to store account information for a plurality of the users, said account information including an account number, security information, and financial information;

a financial database to store financial information including stock information, options information, and mutual fund information;

a speech recognition unit, disposed to receive said speech signals, for matching said speech signal with one or more terms in said library of terms to generate a matched term for each of said speech signals;

an account module, for requesting an account identifier from the user, for receiving a first of said matched terms representing said account identifier, for matching said account identifier with said account information of the user in said customer database;

a quote module for requesting information from the user, for receiving a third of said matched terms from said speech recognition unit, for identifying a first identifier represented by said third matched term, for identifying first quote information associated with said first identifier from said financial database, generating a signal representing said first quote information;

a transmitting unit for transmitting said first quote information to the user.

2. The system of claim 1, wherein said first identifier is one of a stock identifier, a mutual fund identifier, an options identifier, and a market index identifier.

3. The system of claim 1, further comprising:

a trade module for receiving a fourth of said matched terms from said speech recognition unit, for identifying a second identifier represented by said fourth matched term, for trading a financial instrument represented by said second identifier;

wherein said transmitting unit transmits a signal representing one of said first quote information and a trade acknowledgment signal representing said trading of said financial instrument represented by said second identifier.

4. The system of claim 3, wherein said second identifier is one of a stock identifier, a mutual fund identifier, and an options identifier.

5. The system of claim 4, further comprising:

a security module, for requesting a security identifier from the user, for receiving a second of said matched terms from said speech recognition unit, for comparing said second matched term with said security information of the user, and for preventing access to account information if said second matched term does not correspond to said security information.

6. The system of claim 1, further comprising:

a security module, for requesting a security identifier from the user, for receiving a second of said matched terms from said speech recognition unit, for comparing said second matched term with said security information of the user, and for preventing access to account information if said second matched term does not correspond to said security information;

7. A computer based method for providing financial information to a user, the method comprising the steps of:

receiving a first speech signal corresponding to a first audio signal from the user, representing an account identifier for the user;

identifying a first term representing said first speech signal;

identifying a user account identified by said first term, said user account stored in a computer memory and having account information including an account number, security information, and financial information;

receiving a second speech signal corresponding to a second audio signal from the user, representing a financial activity request;

identifying a second term representing said second speech signal;

identifying a financial activity represented by said second term;

performing said financial activity; and

providing financial information to the user based upon said financial activity.

8. The computer based method of claim 7, further comprising the step of:

receiving a third speech signal corresponding to a third audio signal from the user representing a security identifier;

identifying a third term representing said security identifier;

preventing the user from performing any financial activity if said security identifier does not satisfy a security test based upon a predefined security code associated with said user account.

9. The computer based method of claim 8, wherein said security test comprises the steps of:

comparing said security identifier with said predefined security code to determine if a match exists; and

identifying said security test as satisfied if said security identifier matches said predefined security code.

10. The computer based method of claim 8, wherein said step of performing said financial activity includes:

requesting activity information from the user;

receiving a fourth speech signal corresponding to a second audio signal from the user representing said activity information;

identifying a fourth term representing said fourth speech signal;

obtaining information from a financial database representing conditions for performing said financial activity based upon said fourth term;

transmitting an audio signal to a user representing said conditions;

receiving a fifth speech signal corresponding to a fifth audio signal from the user representing a user instruction;

identifying a fifth term representing said user instruction; and

execute said financial activity if said fifth term corresponds to an execute command.

11. The computer based method of claim 10, wherein said financial activity corresponds to one of obtaining a quote for a financial instrument and trading said financial instrument.

12. The computer based method of claim 11, wherein said financial instrument is one of a stock, a mutual fund, and an option.

13. The computer based method of claim 11, wherein said financial instrument is one of a stock, a mutual fund, an option, a future, a commodity, a unit investment trust (UIT), a real estate investment trust (REIT), a foreign currency, a real property, and a precious metal.

14. The computer based method of claim 7, wherein said step of performing said financial activity includes:

requesting activity information from the user;

receiving a third speech signal corresponding to a third audio signal from the user representing said activity information;

identifying a third term representing said third speech signal;

obtaining information from a financial database representing conditions for performing said financial activity based upon said third term;

transmitting an audio signal to a user representing said conditions;

receiving a fourth speech signal corresponding to a fourth audio signal from the user representing a user instruction;

identifying fourth term representing said user instruction; and

execute said financial activity if said fourth term corresponds to an execute command.

15. The computer based method of claim 14, wherein said financial activity corresponds to one of obtaining a quote for a financial instrument and trading said financial instrument.

16. The computer based method of claim 15, wherein said financial instrument is one of a stock, a mutual fund, and an option.

17. The computer based method of claim 15, wherein said financial instrument is one of a stock, a mutual fund, an option, a future, a commodity, a unit investment trust (UIT), a real estate investment trust (REIT), a foreign currency, a real property, and a precious metal.

18. A computer based system for providing financial information to a user, comprising:

receiving means, for receiving a first speech signal corresponding to a first audio signal from the user, representing an account identifier for the user, and for receiving a second speech signal corresponding to a second audio signal from the user, representing a financial activity request;

speech identifying means, disposed to receive signals from said receiving means, for identifying a first term representing said first speech signal and for identifying a second term representing said second speech signal;

term identifying means, disposed to receive signals from said speech identifying means, for identifying a user account identified by said first term, said user account stored in a computer memory and having account information including an account number, security information, and financial information and for identifying a financial activity represented by said second term;

performing means, disposed to receive signals from said term identifying means, for performing said financial activity; and

providing means, for providing financial information to the user based upon said financial activity.

19. The computer based system of claim 18, wherein said receiving means receives a third speech signal corresponding to a third audio signal from the user representing a security identifier; and

wherein said speech identifying means identifies a third term representing said security identifier;

said computer based system further comprising:

security means, disposed to receive signals from said speech identifying means, for preventing the user from performing any financial activity if said security identifier does not satisfy a security test based upon a predefined security code associated with said user account.

20. The computer based system of claim 18, wherein receiving means receives a third speech signal corresponding to a third audio signal from the user representing said activity information and for receiving a fourth speech signal corresponding to a fourth audio signal from the user representing a user instruction;

wherein said speech identifying means identifies a third term representing said third speech signal; and

wherein said performing means further comprises:

information gathering means, for obtaining information from a financial database representing conditions for performing said financial activity based upon said third term,

execution means, for executing said financial activity if said fourth term corresponds to an execute command.

21. The computer based system of claim 18, wherein said financial activity corresponds to one of obtaining a quote for a financial instrument and trading said financial instrument.

22. The computer based system of claim 21, wherein said financial instrument is one of a stock, a mutual fund, and an option.

23. The computer based system of claim 21, wherein said financial instrument is one of a stock, a mutual fund, an option, a future, a commodity, a unit investment trust (UIT), a real estate investment trust (REIT), a foreign currency, a real property, and a precious metal.

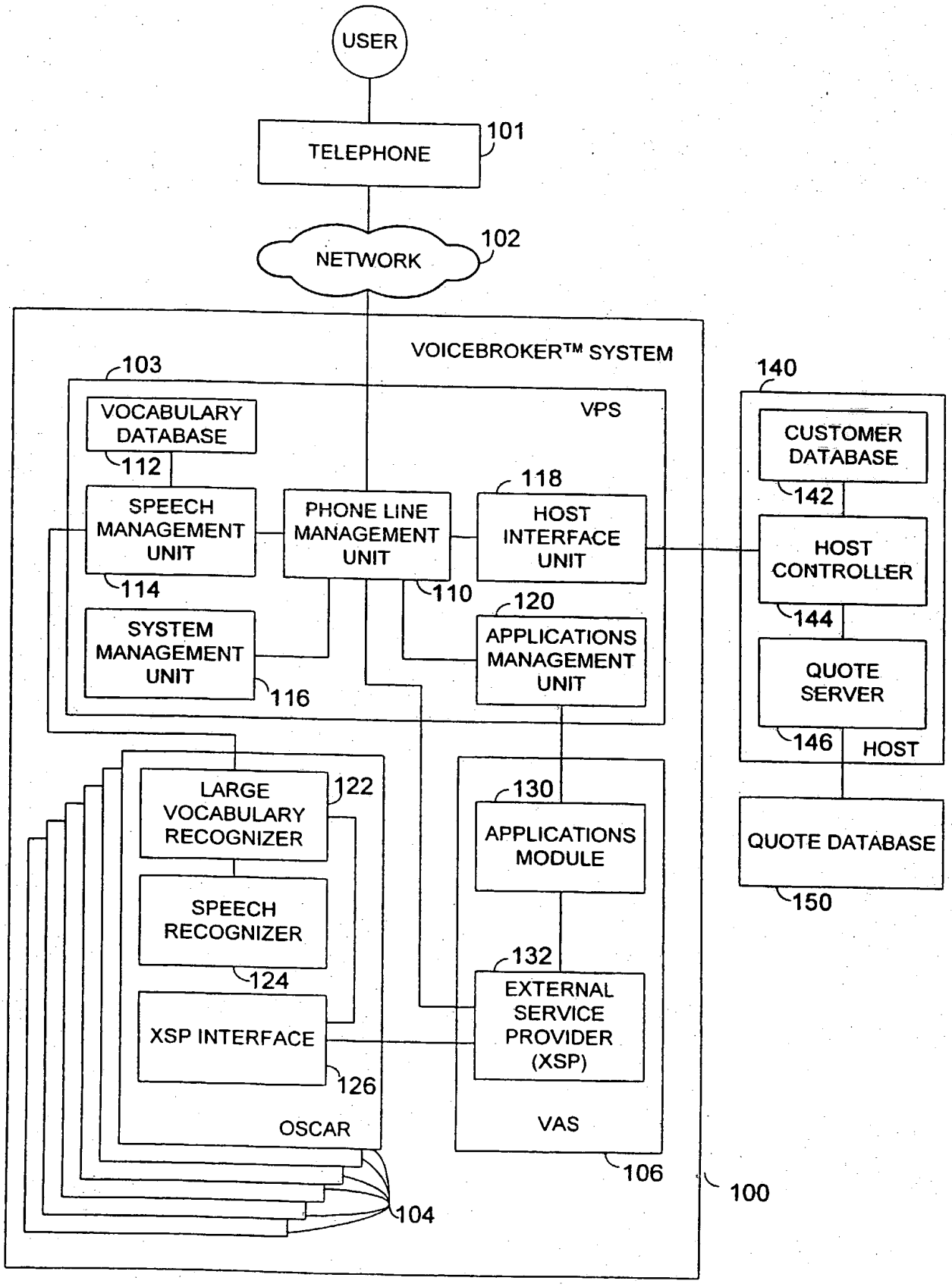
USER
TELEPHONE
101
NETWORK
102
VOICEBROKER™ SYSTEM
103
VPS
VOCABULARY DATABASE
112
SPEECH MANAGEMENT UNIT
114
PHONE LINE MANAGEMENT UNIT
110
HOST INTERFACE UNIT
118
SYSTEM MANAGEMENT UNIT
116
APPLICATIONS MANAGEMENT UNIT
120
140
CUSTOMER DATABASE
142
HOST CONTROLLER
144
QUOTE SERVER
146
HOST
QUOTE DATABASE
150
LARGE VOCABULARY RECOGNIZER
122
SPEECH RECOGNIZER
124
XSP INTERFACE
126
OSCAR
130
APPLICATIONS MODULE
132
EXTERNAL SERVICE PROVIDER (XSP)
VAS
106
104
100

FIGURE 1

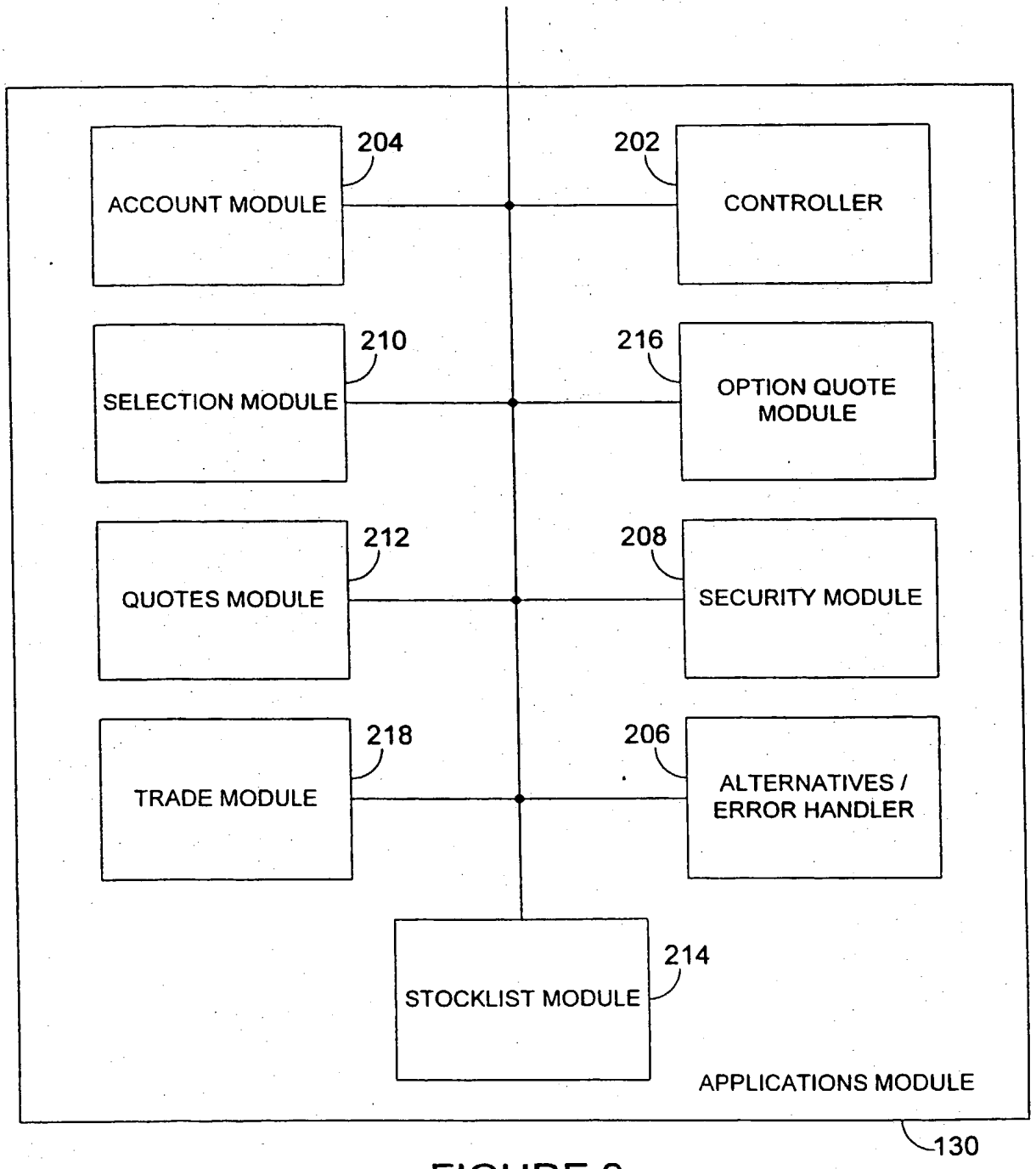
ACCOUNT MODULE
204
CONTROLLER
202
SELECTION MODULE
210
OPTION QUOTE MODULE
216
QUOTES MODULE
212
SECURITY MODULE
208
TRADE MODULE
218
ALTERNATIVES / ERROR HANDLER
206
STOCKLIST MODULE
214
APPLICATIONS MODULE
130

FIGURE 2

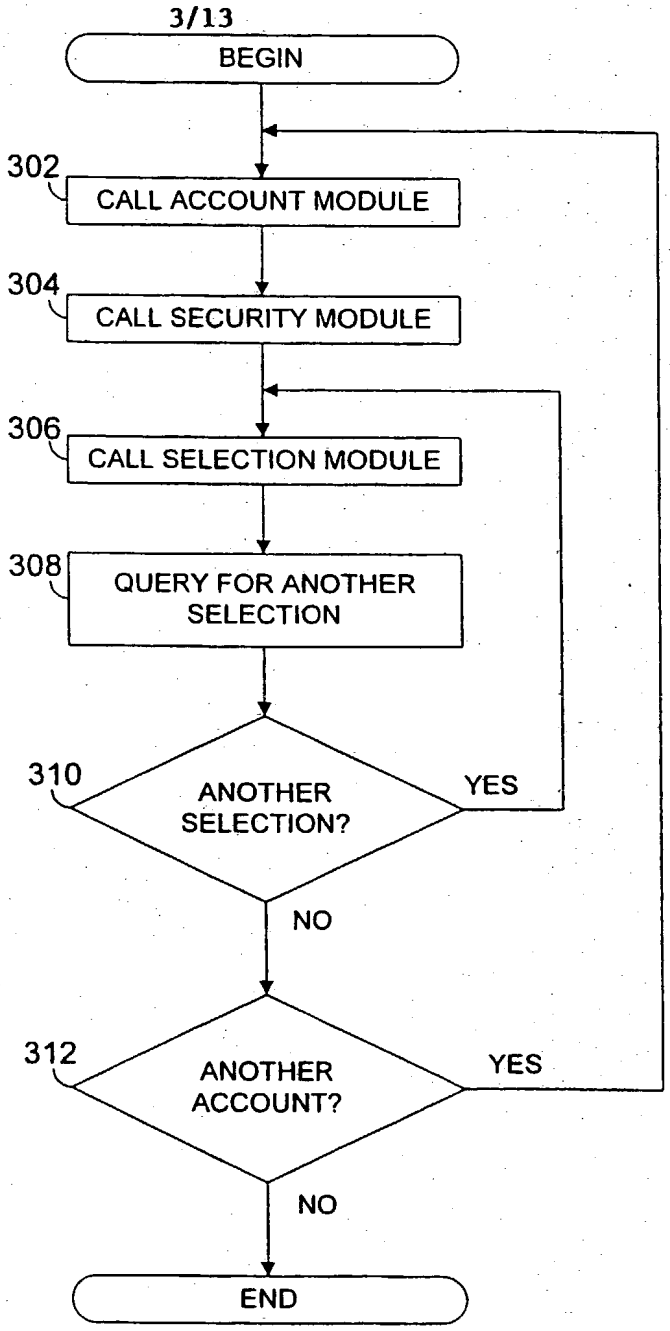
BEGIN
302
CALL ACCOUNT MODULE
304
CALL SECURITY MODULE
306
CALL SELECTION MODULE
308
QUERY FOR ANOTHER SELECTION
310
ANOTHER SELECTION?
YES
NO
312
ANOTHER ACCOUNT?
YES
NO
END

FIGURE 3

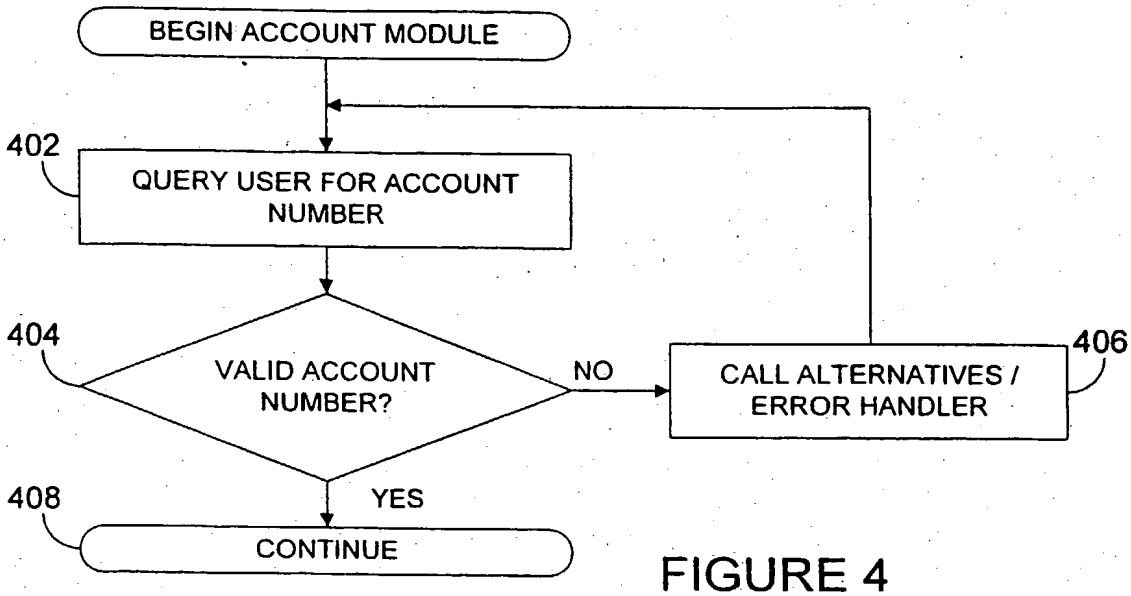


FIGURE 4

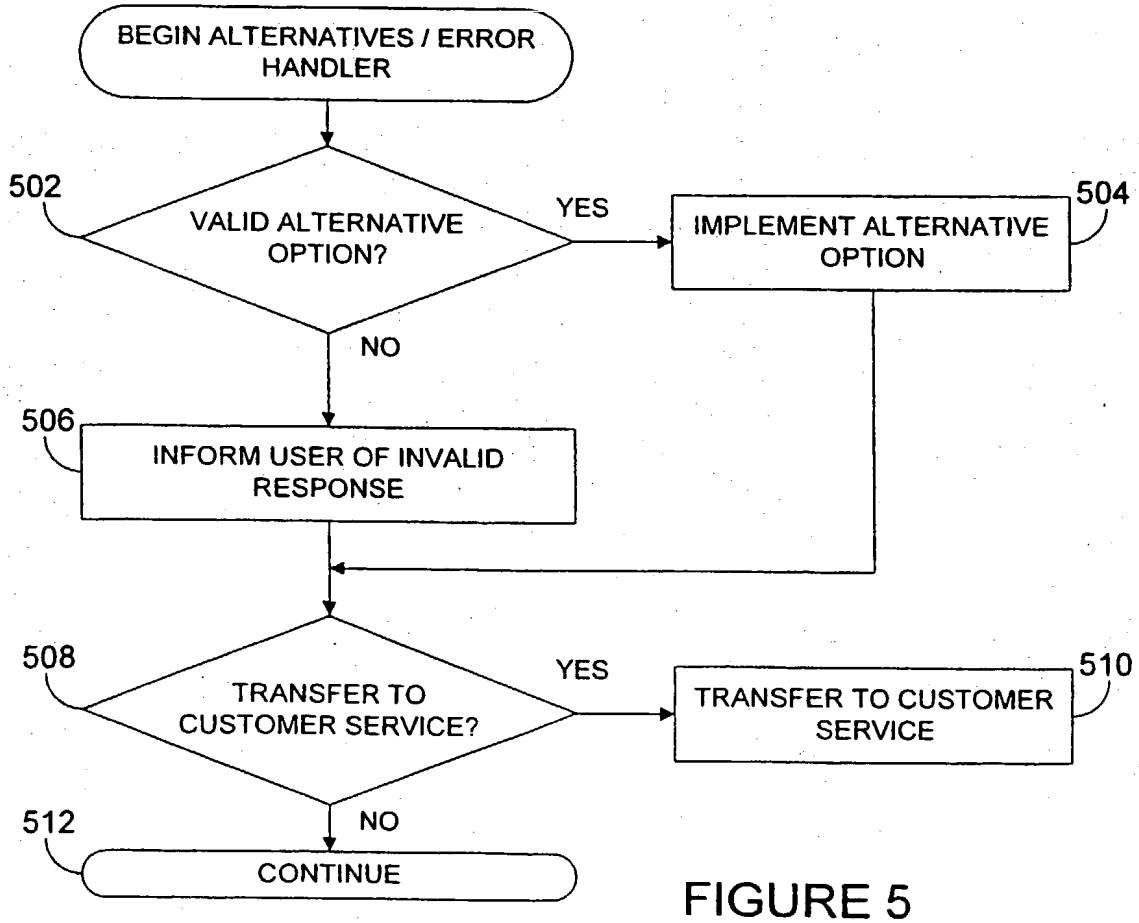


FIGURE 5

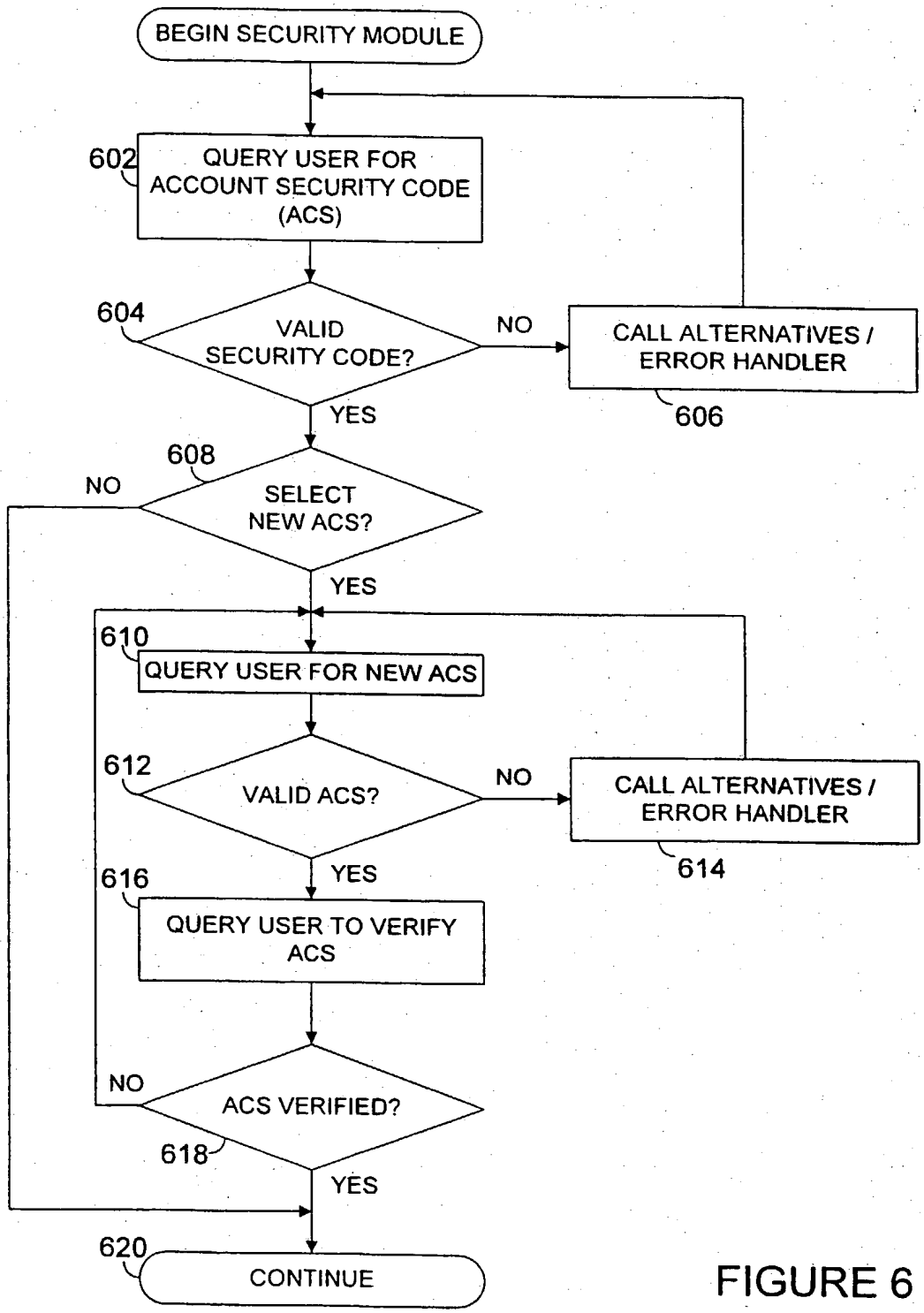
BEGIN SECURITY MODULE
602
QUERY USER FOR ACCOUNT SECURITY CODE (ACS)
604
VALID SECURITY CODE?
NO
CALL ALTERNATIVES / ERROR HANDLER
606
YES
608
SELECT NEW ACS?
NO
YES
610
QUERY USER FOR NEW ACS
612
VALID ACS?
NO
CALL ALTERNATIVES / ERROR HANDLER
614
YES
616
QUERY USER TO VERIFY ACS
NO
ACS VERIFIED?
618
YES
620
CONTINUE

FIGURE 6

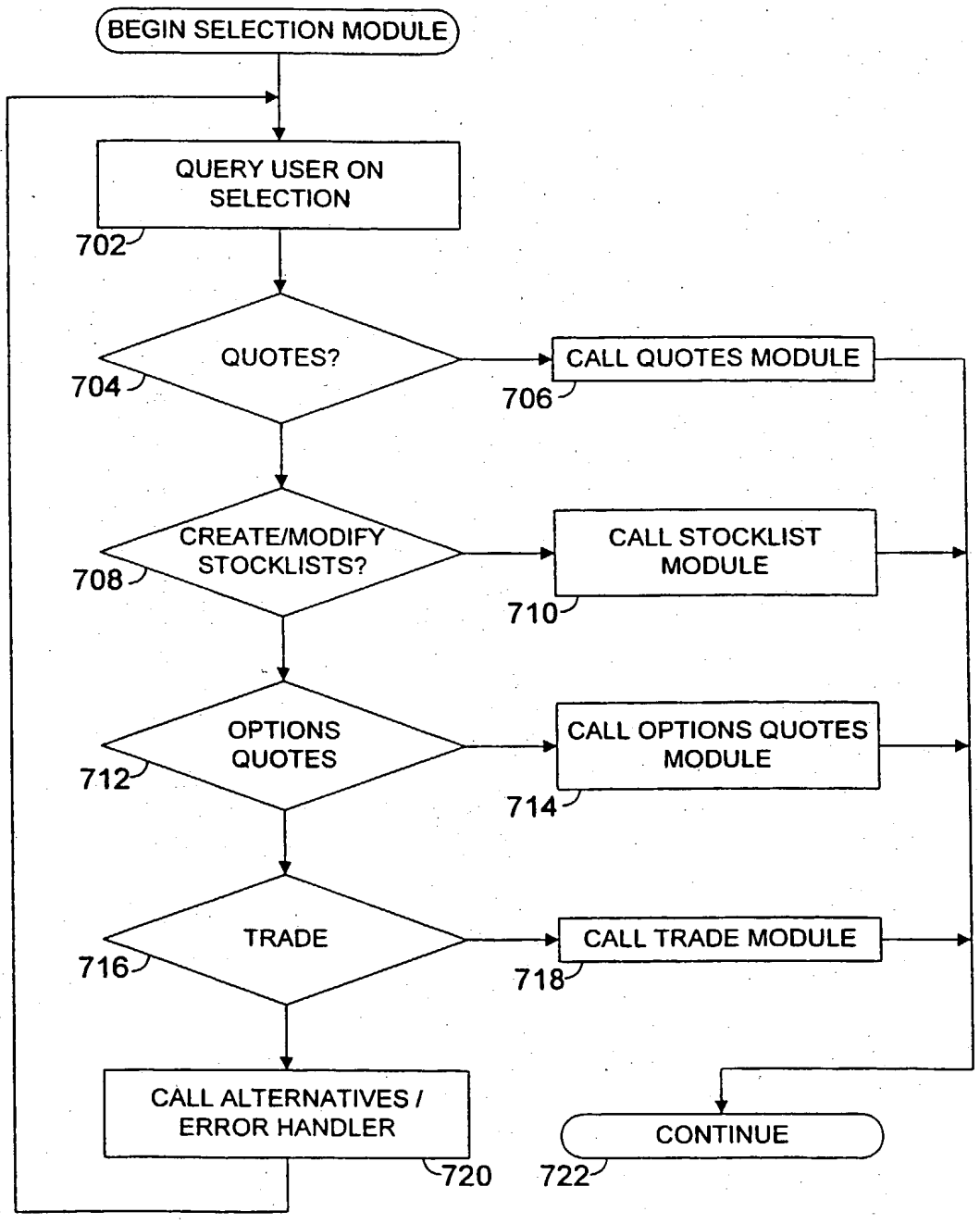
BEGIN SELECTION MODULE
QUERY USER ON SELECTION
702
QUOTES?
704
CALL QUOTES MODULE
706
CREATE/MODIFY STOCKLISTS?
708
CALL STOCKLIST MODULE
710
OPTIONS QUOTES
712
CALL OPTIONS QUOTES MODULE
714
TRADE
716
CALL TRADE MODULE
718
CALL ALTERNATIVES / ERROR HANDLER
720
CONTINUE
722

FIGURE 7

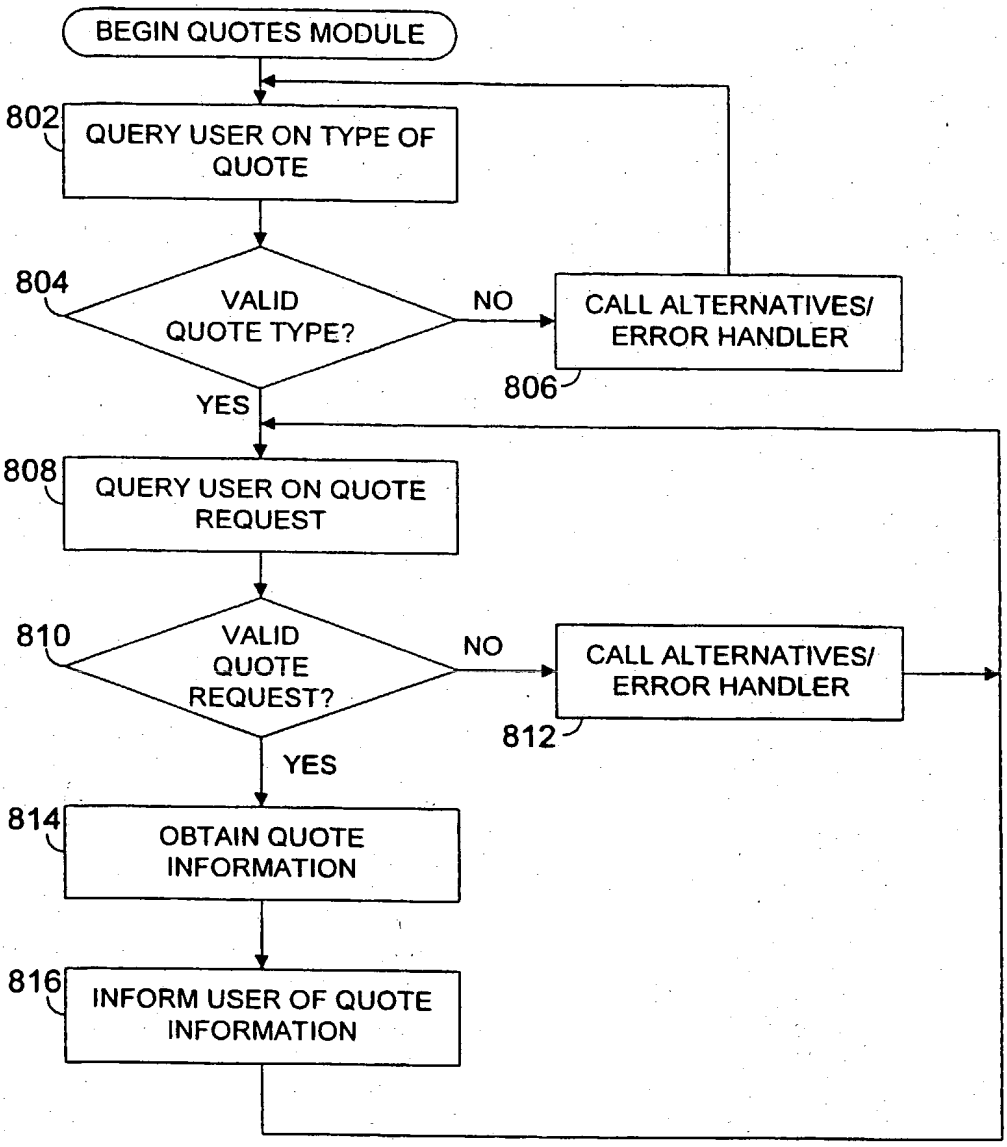
BEGIN QUOTES MODULE
802
QUERY USER ON TYPE OF QUOTE
804
VALID QUOTE TYPE?
NO
CALL ALTERNATIVES/ ERROR HANDLER
806
YES
808
QUERY USER ON QUOTE REQUEST
810
VALID QUOTE REQUEST?
NO
CALL ALTERNATIVES/ ERROR HANDLER
812
YES
814
OBTAIN QUOTE INFORMATION
816
INFORM USER OF QUOTE INFORMATION

FIGURE 8

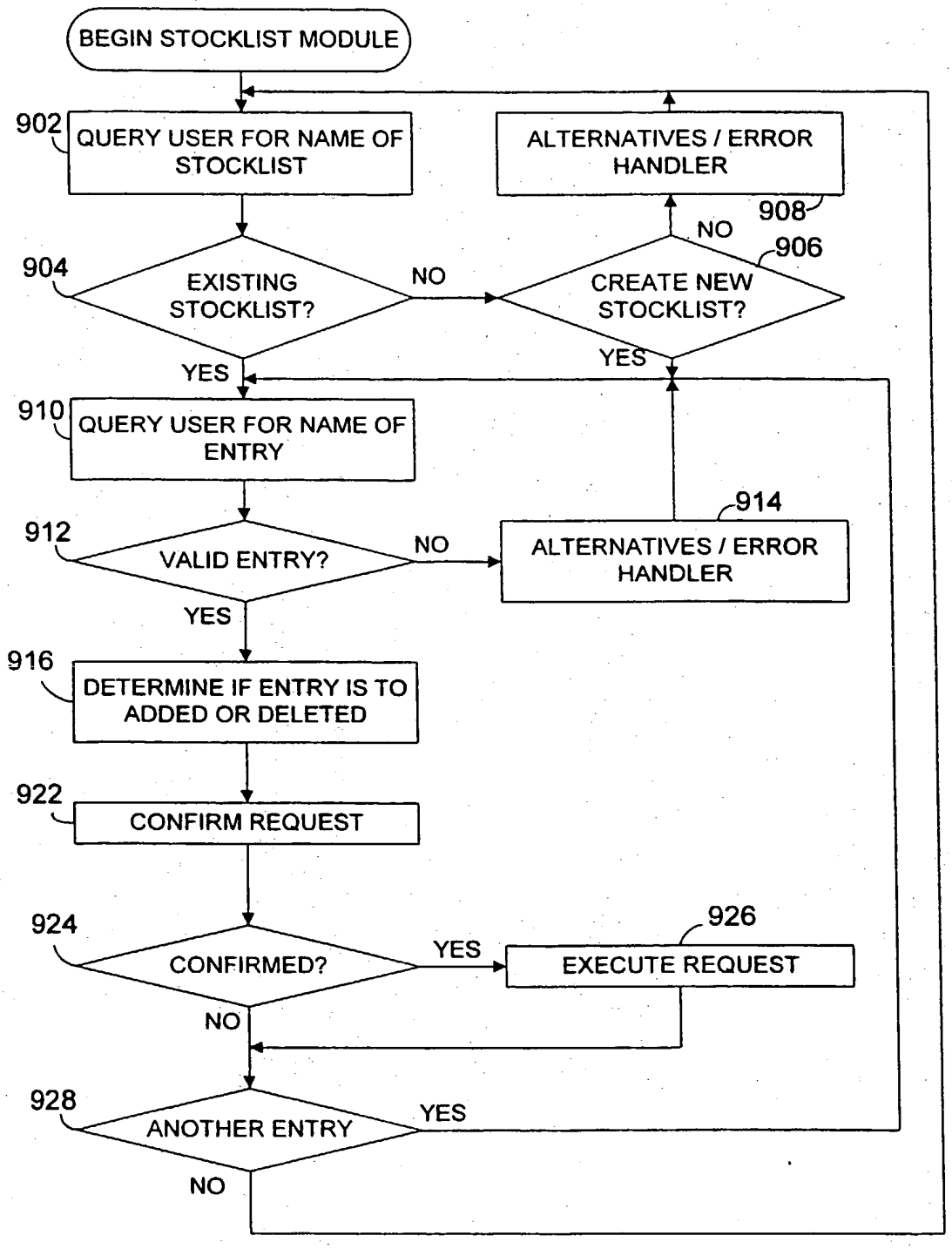
BEGIN STOCKLIST MODULE
902
QUERY USER FOR NAME OF STOCKLIST
904
EXISTING STOCKLIST?
NO
ALTERNATIVES / ERROR HANDLER
908
NO
906
CREATE NEW STOCKLIST?
YES
YES
910
QUERY USER FOR NAME OF ENTRY
912
VALID ENTRY?
NO
914
ALTERNATIVES / ERROR HANDLER
YES
916
DETERMINE IF ENTRY IS TO ADDED OR DELETED
922
CONFIRM REQUEST
924
CONFIRMED?
YES
926
EXECUTE REQUEST
NO
928
ANOTHER ENTRY
YES
NO

FIGURE 9

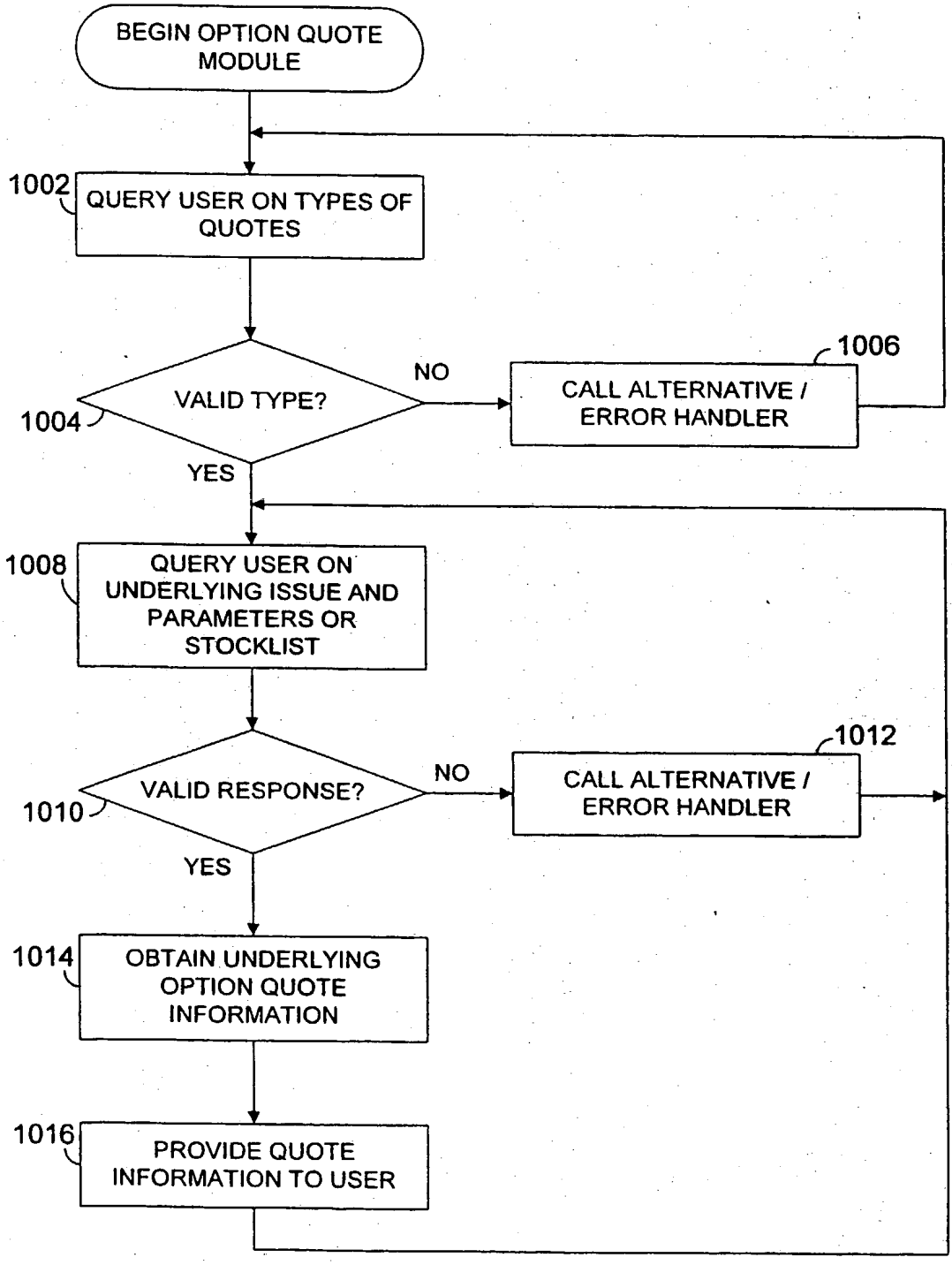
BEGIN OPTION QUOTE MODULE
1002
QUERY USER ON TYPES OF QUOTES
VALID TYPE?
1004
NO
1006
CALL ALTERNATIVE / ERROR HANDLER
YES
1008
QUERY USER ON UNDERLYING ISSUE AND PARAMETERS OR STOCKLIST
VALID RESPONSE?
1010
NO
1012
CALL ALTERNATIVE / ERROR HANDLER
YES
1014
OBTAIN UNDERLYING OPTION QUOTE INFORMATION
1016
PROVIDE QUOTE INFORMATION TO USER

FIGURE 10

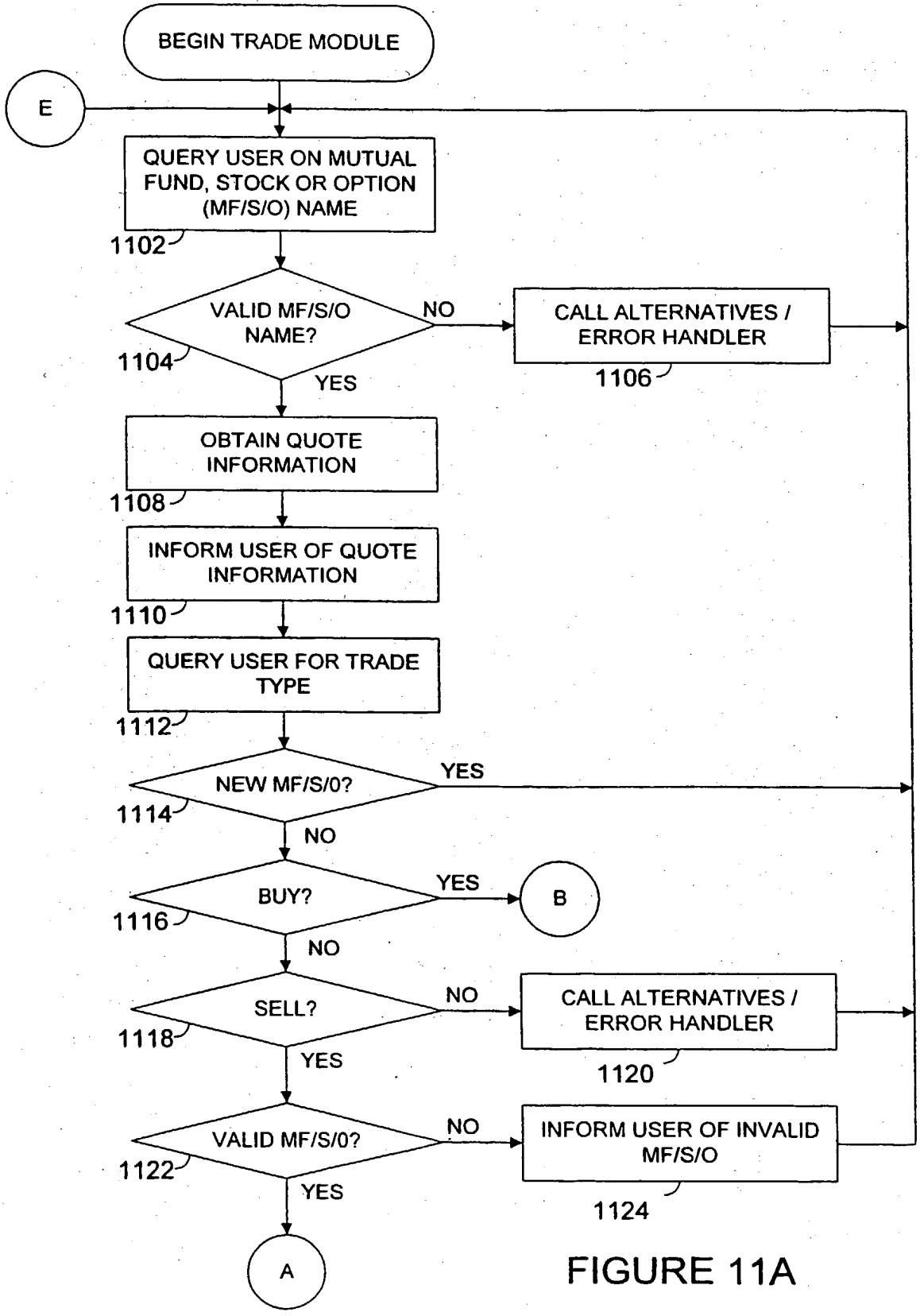
BEGIN TRADE MODULE
E
QUERY USER ON MUTUAL FUND, STOCK OR OPTION (MF/S/O) NAME
1102
VALID MF/S/O NAME?
1104
NO
CALL ALTERNATIVES / ERROR HANDLER
1106
YES
OBTAIN QUOTE INFORMATION
1108
INFORM USER OF QUOTE INFORMATION
1110
QUERY USER FOR TRADE TYPE
1112
NEW MF/S/0?
1114
YES
NO
BUY?
1116
YES
B
NO
SELL?
1118
NO
CALL ALTERNATIVES / ERROR HANDLER
1120
YES
VALID MF/S/0?
1122
NO
INFORM USER OF INVALID MF/S/O
1124
YES
A

FIGURE 11A

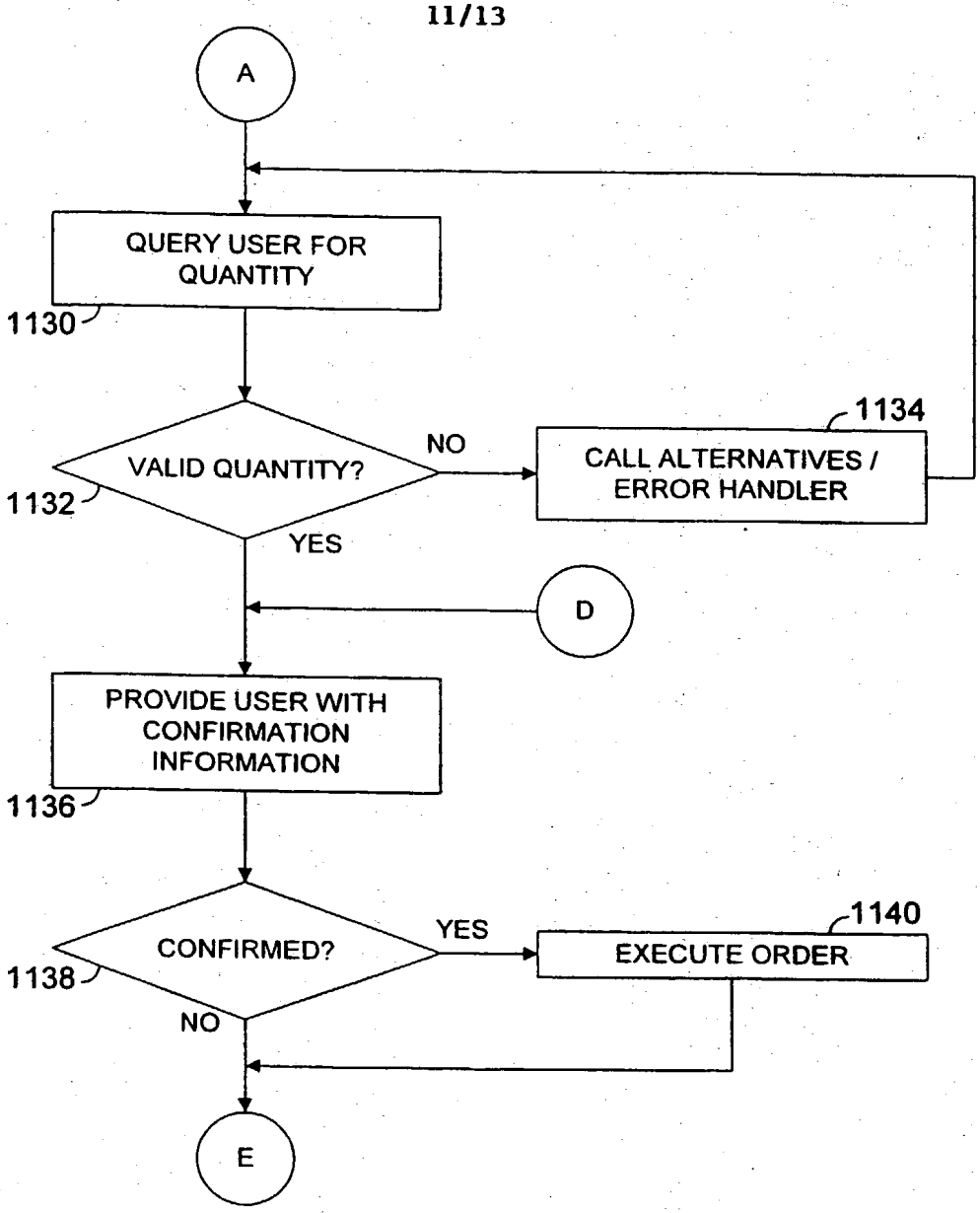
A
QUERY USER FOR QUANTITY
1130
VALID QUANTITY?
1132
NO
1134
CALL ALTERNATIVES / ERROR HANDLER
YES
D
PROVIDE USER WITH CONFIRMATION INFORMATION
1136
CONFIRMED?
1138
YES
1140
EXECUTE ORDER
NO
E

FIGURE 11B

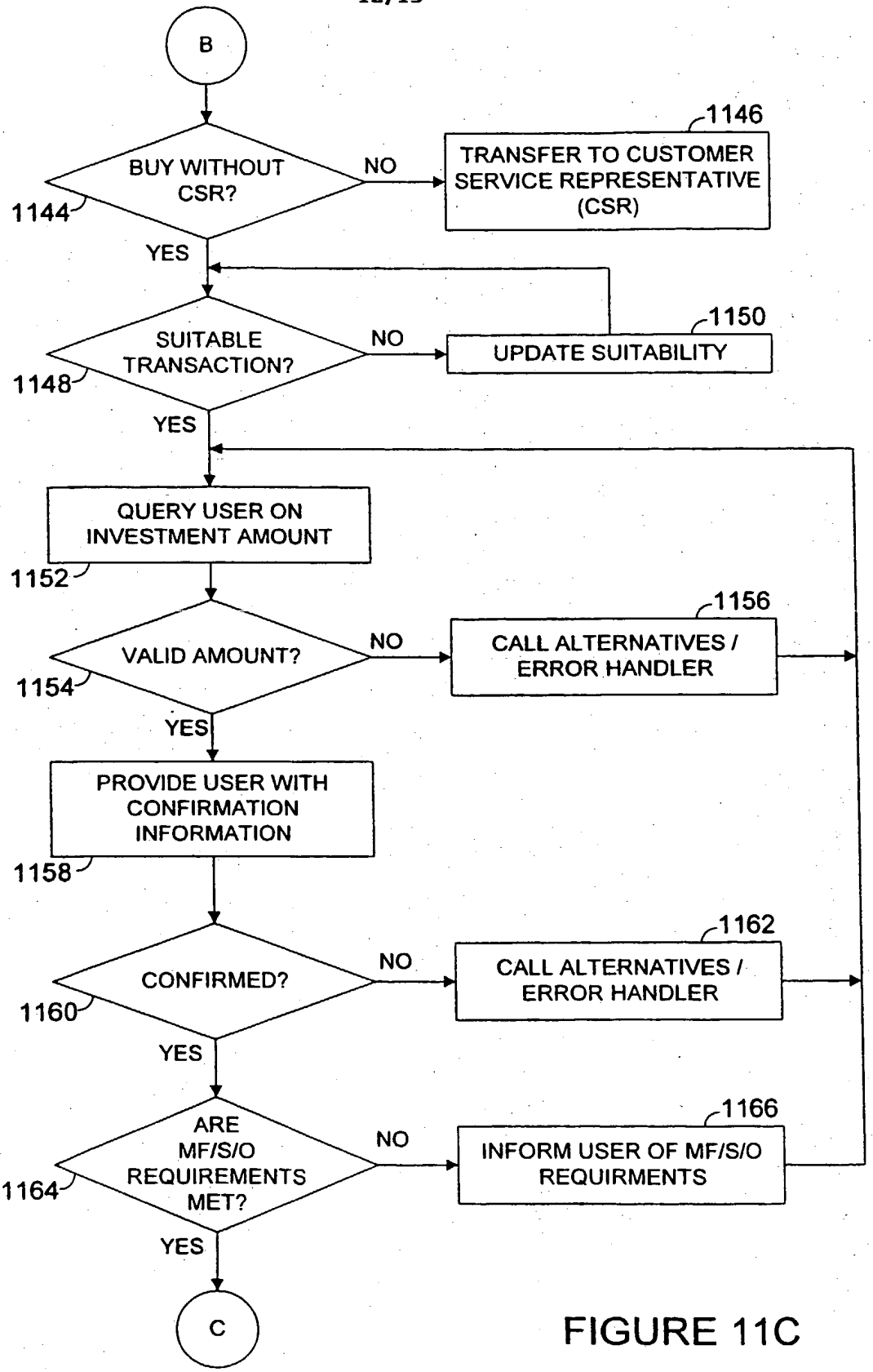
B
BUY WITHOUT CSR?
1144
NO
1146
TRANSFER TO CUSTOMER SERVICE REPRESENTATIVE (CSR)
YES
SUITABLE TRANSACTION?
1148
NO
1150
UPDATE SUITABILITY
YES
QUERY USER ON INVESTMENT AMOUNT
1152
VALID AMOUNT?
1154
NO
1156
CALL ALTERNATIVES / ERROR HANDLER
YES
PROVIDE USER WITH CONFIRMATION INFORMATION
1158
CONFIRMED?
1160
NO
1162
CALL ALTERNATIVES / ERROR HANDLER
YES
ARE MF/S/O REQUIREMENTS MET?
1164
NO
1166
INFORM USER OF MF/S/O REQUIRMENTS
YES
C

FIGURE 11C

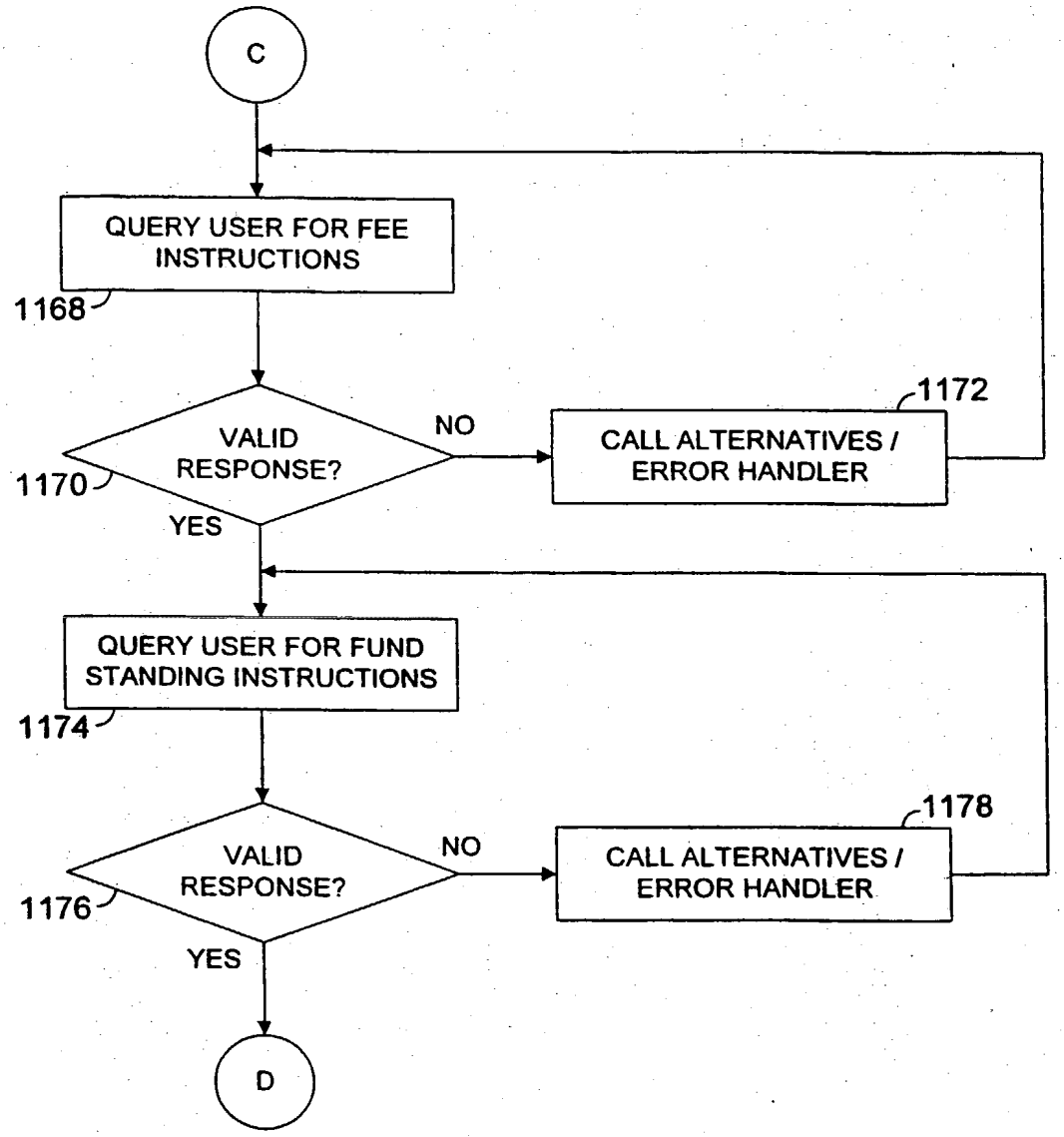
C
QUERY USER FOR FEE INSTRUCTIONS
1168
VALID RESPONSE?
1170
NO
CALL ALTERNATIVES / ERROR HANDLER
1172
YES
QUERY USER FOR FUND STANDING INSTRUCTIONS
1174
VALID RESPONSE?
1176
NO
CALL ALTERNATIVES / ERROR HANDLER
1178
YES
D

FIGURE 11D

# INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/13355

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :G06F 17/60
US CL :705/35

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 705/35, 36, 37; 379/88.01, 88.02, 88.03; 704/221, 231, 243

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS (((stock# or bond#) (3a) (quote# or data or information or trad?)) (10a) (speech or voice)) and ((speech or voice ) (a) (recognition or synthesiz?)), Dialog (see attached)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | US 5,390,278 A (GUPTA et al) 14 February 1995, Fig. 17, col. 22, lines 52-55, lines 62-65, col: 23, lines 6-22. | 1-23 |
| Y | US 5,036,539 A (WRENCH, Jr. et al) 30 July 1991, col. 1, lines 15-20, col. 10, lines 65-69. | 1-23 |
| A | US 5,181,238 A (MEDAMANA et al) 19 January 1993, see abstract. | 1-23 |
| A | US 5,239,573 A (RANGAN) 24 August 1993, see abstract. | 1-23 |
| A | US 5,036,538 A (OKEN et al) 30 July 1991, see abstract. | 1-23 |

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

| | | | |
|---|---|---|---|
| * | Special categories of cited documents | "T" | later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| "A" | document defining the general state of the art which is not considered to be of particular relevance | "X" | document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| "E" | earlier document published on or after the international filing date | "Y" | document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| "L" | document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | "&" | document member of the same patent family |
| "O" | document referring to an oral disclosure, use, exhibition or other means | | |
| "P" | document published prior to the international filing date but later than the priority date claimed | | |

| | |
|---|---|
| Date of the actual completion of the international search<br>14 SEPTEMBER 1998 | Date of mailing of the international search report<br>13 OCT 1998 |
| Name and mailing address of the ISA/US<br>Commissioner of Patents and Trademarks<br>Box PCT<br>Washington, D.C. 20231<br>Facsimile No. (703) 305-3230 | Authorized officer<br>EMANUEL TODD VOELTZ<br>Telephone No. (703) 305-9714 |

Form PCT/ISA/210 (second sheet)(July 1992)*

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/13355

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | ANONYMOUS. Management and Strategy: VERBEX, DEC tap Australians for FX Deal-Capture System. Trading Systems Technology. 2 December 1991, Vol. 5, No. 11, 2 pages. | 3-5, 10-17, and 20-23 |
| A | Database IAC PROMT on Dialog, Information Access Company (Foster City, CA, USA), No. 4410333, ANONYMOUS,'Speech Recognition: Breakthrough in Technology to Radically Change the Way Consumers Use Their Telephones', 3 pages, Edge Publishing, 15 March 1993. | 1-23 |

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